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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/005,803	12/05/2001	Hsin-Ching Shih	TS01-663	9432

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EXAMINER
CHEN, KIN CHAN

ART UNIT	PAPER NUMBER
1765	6

DATE MAILED: 06/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/005,803	SHIH ET AL.	
	Examiner	Art Unit	
	Kin-Chan Chen	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) *8 and 10* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9 and 11-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2,3* .
4) ☐ Interview Summary (PTO-413) Paper No(s) _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of species group A in Paper No. 5 is acknowledged. The traversal is on the ground(s) that the field of search must cover both species to provide a complete and adequate search. This is not found persuasive because they are patentably distinct and because it involves different search and would impose a serious administrative burden on the examiner, it requires restriction / election.

The requirement is still deemed proper and is therefore made FINAL.

Examination will be limited to the claims to the elected species (claims 1-7, 9, and 11-16), with claims 8 and 10 drawn to non-elected species held withdrawn.

Specification

2. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: In claim 1, line 1, "a method of applying solvents for the removal of polymer from exposed surfaces" is not described in the specification. The abstract and the specification (page 1, field of the invention) describes that the method is provided for the removal of solvents from exposed surfaces which conflicts with the above description of claim 1.

Claim Rejections - 35 USC § 112

3. Claims 6, 7, 9, and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 6, 7, 9, and 15, "organ carrier gas" is vague and indefinite. For the patent examining purpose, the examiner assumes that it is--argon carrier gas--.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-5, 12-14, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art in view of Catabay et al. (US 6,503,840; hereinafter "Catabay").

The admitted prior art is relied on only to show the conventional dual damascene process comprising: providing a substrate with at least one point of electrical contact comprising copper; depositing an etch stop layer over the substrate; depositing at least one layer of dielectric over the surface of the etch stop layer; creating at least one

opening through at least one layer of dielectric provided over the surface of the etch stop layer, at least one opening having sidewalls and a bottom surface; removing the etch stop layer from the bottom surface of the at least one opening (specification, pages 2-4).

Unlike the claimed invention, admitted prior art does not teach that after at least one opening is created, applying the first plasma treatment to the exposed surfaces, applying a DI water rinse, applying a second plasma treatment to the exposed surfaces.

In a method of forming damascene structure, Catabay teaches the etching residues are accumulated over exposed surfaces (so-called accumulation of polymers over exposed surfaces in the instant claims). Catabay teaches that after at least one opening is created, applying the first plasma treatment (such as oxygen) to the exposed surfaces, applying a commercially available solvent for rinsing, applying a second plasma treatment (such as hydrogen) to the exposed surfaces (col. 6, lines 30 to col. 7, lines 30) in order to have a reduced number of unfilled or unsatisfactorily filled openings. Hence, it would have been obvious to one with ordinary skilled in the art to use the said process steps of Catabay in the conventional dual damascene process (admitted prior art) in order to have a reduced number of unfilled or unsatisfactorily filled openings. Catabay is not particular about the commercially available solvent, hence, it would have been obvious to one with ordinary skilled in the art to use DI water because it is one of the most popular commercially available solvent for rinsing.

As to dependent claims 2-4, 12 and 13, because the same plasma are used for cleaning the residues in the openings, it appears that the method of Catabay would

inherently contain the same properties and functions as claimed (such as providing chemically interaction that enabling the removal of the residues; byproducts of the first plasma treatment being water soluble; not causing damage).

Claims 6,7,9, 11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art and Catabay as applied to claims 1-5, 11-14, and 16 above, and further in view of Zhao et al (US 6,204,192; hereinafter "Zhao").

The discussion of modified admitted prior art and Catabay from above is repeated here.

Unlike the claimed invention, the combined prior art of admitted prior art and Catabay dose not teach using the nitrogen with oxygen (claims 6 and 7), in the method of removing etch residues and cleaning the exposed surface of openings, Zhao (col. 8, lines 30-39) teaches that a plasma of nitrogen, oxygen, or a combination of nitrogen and oxygen may be used. Hence, It would have been obvious to one skilled in the art to use nitrogen (claim 9) or the combination of nitrogen and oxygen (claims 6 and 7), rather than oxygen in Catabay's process because Zhao **teaches the equivalence between using these plasma** in the process that are similar to those as taught by Catabay. The substitution of one for the other would have been expected to provide the expected result. As to dependent claim 11, Zhao teaches low-k dielectric (abstract, Figures).

As to dependent claim 15, Zhao (col. 8, lines 40-48) teaches that hydrogen plasma may be used for removing etch residues and cleaning the exposed surface of openings. Nitrogen gas may also be used to facilitate ignition of the plasma (col. 5, lines 30-32). Hence, it would have been obvious to one with ordinary skilled in the art to

modify Catabay's process by using hydrogen and nitrogen as taught by Zhao so as to facilitate ignition of the plasma.

The above-cited claims differ from the prior art by specifying well-known features (such as using argon carrier gas and plasma reactors in claims 6, 7, 9, and 15) to the art of semiconductor device fabrication and using various processing parameters (such as claims 6, 7, 9, and 15). However, process parameters are commonly determined by routine experiment. The process of conducting routine optimizations so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, A person having ordinary skill in the art would have found it obvious to modify the combined prior art by performing routine experiments by using different processing parameters to obtain optimal result and adding any of same well-known features to same in order to provide their art recognized advantages and produce an expected result.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (703) 305-0222. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-2934.

K. C. Chen
Primary Examiner
Art Unit 1765
6-6-05